

What is claimed is:

1. An arrayed waveguide grating comprising:
one or plural input waveguides for inputting
signal lights;
5 a plurality of output waveguides for output-
ting signal lights;
a channel waveguide array having waveguides
which are successively longer with predetermined
waveguide length differences;
10 an input slab waveguide connecting an input
end of said channel waveguide array to said input
waveguides; and
an output slab waveguide connecting an output
end of said channel waveguide array to said output
15 waveguides, and having optical input/output characteris-
tics set to predetermined ratios for the respective out-
put waveguides with respect to said input waveguides.
2. An arrayed waveguide grating comprising:
20 one or plural input waveguides for inputting
signal lights;
a plurality of output waveguides for output-
ting signal lights;
a channel waveguide array having waveguides
25 which are successively longer with predetermined
waveguide length differences;

an input slab waveguide connecting an input
end of said channel waveguide array to said input
waveguides; and

an output slab waveguide connecting an output
5 end of said channel waveguide array to said output
waveguides, and having optical input/output characteris-
tics set to predetermined ratios for the respective out-
put waveguides with respect to said input waveguides de-
pending on the differences between optical losses along
10 respective paths in the output slab waveguide.

3. An arrayed waveguide grating comprising:

a plurality of input waveguides for inputting
signal lights having different wavelengths each other;

15 one or plural output waveguides for outputting
signal lights;

a channel waveguide array having waveguides
which are successively longer with predetermined
waveguide length differences;

20 an output slab waveguide connecting an output
end of said channel waveguide array to said output
waveguides; and

an input slab waveguide connecting an input
end of said channel waveguide array to said input
25 waveguides, and having optical input/output characteris-

tics set to predetermined ratios for the respective input waveguides corresponding to the output waveguides.

4. An arrayed waveguide grating comprising:
- 5 a plurality of input waveguides for inputting signal lights having different wavelengths each other; one or plural output waveguides for outputting signal lights;
- a channel waveguide array having waveguides
- 10 which are successively longer with predetermined waveguide length differences;
- an output slab waveguide connecting an output end of said channel waveguide array to said output waveguides; and
- 15 an input slab waveguide connecting an input end of said channel waveguide array to said input waveguides, and having optical input/output characteristics set to predetermined ratios for the respective input waveguides corresponding to the output waveguides depending on the differences between optical losses along re-
- 20 spective paths in the output slab waveguide.

5. An arrayed waveguide grating comprising:
- one or plural input waveguides for inputting
- 25 signal lights;

a plurality of output waveguides for outputting signal lights;

a channel waveguide array having waveguides which are successively longer with predetermined
5 waveguide length differences;

an input slab waveguide connecting an input end of said channel waveguide array to said input waveguides; and

an output slab waveguide connecting an output
10 end of said channel waveguide array to said output waveguides, said output slab waveguide having a core layer disposed therein for propagating light there-through, said core layer being partly cut off in selected or all paths therein which interconnect said channel
15 waveguide array and said output waveguides, and a cladding layer disposed in cut regions of the core layer and on opposite sides of the core layer, said cut regions in the paths having cut lengths set to predetermined values in the direction in which the signal lights propagate,
20 depending on optical losses of the signal lights propagated in the paths.

6. An arrayed waveguide grating comprising:

a plurality of input waveguides for inputting
25 signal lights having different wavelengths each other;

one or plural output waveguides for outputting
signal lights;

a channel waveguide array having waveguides
which are successively longer with predetermined
5 waveguide length differences;

an output slab waveguide connecting an output
end of said channel waveguide array to said output
waveguides; and

an input slab waveguide connecting an input
10 end of said channel waveguide array to said input
waveguides, said input slab waveguide having a core layer
disposed therein for propagating light therethrough, said
core layer being partly cut off in selected or all paths
therein which interconnect said channel waveguide array
15 and said input waveguides, and a cladding layer disposed
in cut regions of the core layer and on opposite sides of
the core layer, said cut regions in the paths having cut
lengths set to predetermined values in the direction in
which the signal lights propagate, depending on optical
20 losses of the signal lights propagated in the paths.

7. An arrayed waveguide grating comprising:

one or plural input waveguides for inputting
signal lights;

25 a plurality of output waveguides for output-
ting signal lights, said output waveguides having at

least one core layer disposed therein for propagating
light therethrough, said core layer being partly cut off,
and a cladding layer disposed in cut regions of the core
layer and on opposite sides of the core layer, said cut
5 regions having cut lengths set to predetermined values
depending on optical losses of the signal lights propa-
gated in the output waveguides;

a channel waveguide array having waveguides
which are successively longer with predetermined
10 waveguide length differences;

an input slab waveguide connecting an input
end of said channel waveguide array to said input
waveguides; and

an output slab waveguide connecting an output
15 end of said channel waveguide array to said output
waveguides.

8. An arrayed waveguide grating comprising:

a plurality of input waveguides for inputting
20 signal lights having different wavelengths each other,
said input waveguides having at least one core layer dis-
posed therein for propagating light therethrough, said
core layer being partly cut off, and a cladding layer
disposed in cut regions of the core layer and on opposite
25 sides of the core layer, said cut regions having cut
lengths set to predetermined values depending on optical

losses of the signal lights propagated in the input waveguides;

one or plural output waveguides for outputting signal lights;

5 a channel waveguide array having waveguides which are successively longer with predetermined waveguide length differences;

an input slab waveguide connecting an input end of said channel waveguide array to said input waveguides; and

an output slab waveguide connecting an output end of said channel waveguide array to said output waveguides.

15 9. An arrayed waveguide grating comprising:

one or plural input waveguides for inputting signal lights;

a channel waveguide array having waveguides which are successively longer with predetermined waveguide length differences;

an input slab waveguide connecting an input end of said channel waveguide array to said input waveguides;

an output slab waveguide connecting an output end of said channel waveguide array to said input end thereof; and

5 a plurality of output waveguides having re-
spective ends connected to the output end of said output
slab waveguide, wherein selected or all of said ends of
the output waveguides have respective central positions
displaced from corresponding focused positions in a di-
rection perpendicular to central axes of the output
waveguides by predetermined values depending on losses to
be given to the signal lights propagated in said output
waveguides.

10

10. An arrayed waveguide grating comprising:

a channel waveguide array having waveguides
which are successively longer with predetermined
waveguide length differences;

15

an input slab waveguide having an output end
connected to an input end of said channel waveguide ar-
ray;

one or plural output waveguides for outputting
signal lights;

20

an output slab waveguide connecting an output
end of said channel waveguide array to said output
waveguides; and

a plurality of input waveguides having respec-
tive ends connected to the input end of said input slab
waveguide, wherein selected or all of said ends of the
input waveguides have respective central positions dis-

placed from corresponding focused positions in a direction perpendicular to central axes of the input waveguides by predetermined values depending on losses to be given to the signal lights propagated in said input waveguides.

11. An arrayed waveguide grating comprising:
a channel waveguide array having waveguides which are successively longer with predetermined waveguide length differences;
an input slab waveguide having an output end connected to an input end of said channel waveguide array;
one or plural input waveguides for inputting signal lights, said input waveguides having output ends connected to an input end of said input slab waveguide;
an output slab waveguide having an input end connected to an output end of said channel waveguide array; and
a plurality of output waveguides having respective ends connected to the output end of said output slab waveguide, wherein selected or all of central axes of said output waveguides are inclined at the interconnected points of the output waveguides and said output slab waveguide at respective angles depending on losses

to be given to the signal lights coupled at said inter-connected points.

12. An arrayed waveguide grating comprising:

5 a channel waveguide array having waveguides which are successively longer with predetermined waveguide length differences;

an input slab waveguide having an output end connected to an input end of said channel waveguide array;
10 ray;

one or plural output waveguides for outputting signal lights;

an output slab waveguide connecting an output end of said channel waveguide array to said output waveguides; and
15

a plurality of input waveguides having respective ends connected to the input end of said input slab waveguide, wherein selected or all of central axes of said input waveguides are inclined at the interconnected points of the input waveguides and said input slab waveguide at respective angles depending on losses to be given to the signal lights coupled at said interconnected points.
20

25 13. An arrayed waveguide grating comprising:

5 a channel waveguide array having waveguides
which are successively longer with predetermined
waveguide length differences;

an input slab waveguide having an output end
5 connected to an input end of said channel waveguide ar-
ray;

one or plural input waveguides for inputting
signal lights, said input waveguides having output ends
connected to an input end of said input slab waveguide;

10 an output slab waveguide having an input end
connected to an output end of said channel waveguide ar-
ray; and

a plurality of output waveguides having re-
spective ends connected to the output end of said output
15 slab waveguide, wherein selected or all widths of the
output waveguides at ends thereof are set to predeter-
mined values depending on losses to be given to the sig-
nal lights.

20 14. An arrayed waveguide grating comprising:

a channel waveguide array having waveguides
which are successively longer with predetermined
waveguide length differences;

an input slab waveguide having an output end
25 connected to an input end of said channel waveguide ar-
ray;

one or plural output waveguides for outputting
signal lights;

an output slab waveguide connecting an output
end of said channel waveguide array to said output
5 waveguides; and

a plurality of input waveguides having respec-
tive ends connected to the input end of said input slab
waveguide, wherein selected or all widths of the input
waveguides at ends thereof are set to predetermined val-
10 ues depending on losses to be given to the signal lights.

15. An arrayed waveguide grating comprising:

a channel waveguide array having waveguides
which are successively longer with predetermined
15 waveguide length differences;

an input slab waveguide having an output end
connected to an input end of said channel waveguide ar-
ray;

one or plural input waveguides for inputting
20 signal lights, said input waveguides having output ends
connected to an input end of said input slab waveguide;

an output slab waveguide having an input end
connected to an output end of said channel waveguide ar-
ray; and

25 a plurality of output waveguides having re-
spective ends connected to the output end of said output

slab waveguide, wherein the lengths between the ends of
the output waveguides and said channel waveguide array
are displaced in the direction of propagation axes of the
output waveguides depending on losses to be given to the
5 signal lights propagated from said channel waveguide ar-
ray to the ends of the output waveguides.

16. An arrayed waveguide grating comprising:
a channel waveguide array having waveguides
10 which are successively longer with predetermined
waveguide length differences;
an input slab waveguide having an output end
connected to an input end of said channel waveguide ar-
ray;
15 one or plural output waveguides for outputting
signal lights;
an output slab waveguide connecting an output
end of said channel waveguide array to said output
waveguides; and
20 a plurality of input waveguides having respec-
tive ends connected to the input end of said input slab
waveguide, wherein the lengths between the ends of the
input waveguides and said channel waveguide array are
displaced in the direction of propagation axes of the in-
25 put waveguides depending on losses to be given to the

signal lights propagated from said channel waveguide array to the ends of the input waveguides.

17. A demultiplexer comprising:

5 an arrayed waveguide grating comprising one or plural input waveguides for inputting signal lights, a plurality of output waveguides for outputting signal lights, a channel waveguide array having waveguides which are successively longer with predetermined waveguide
10 length differences, an input slab waveguide connecting an input end of said channel waveguide array to said input waveguides, and an output slab waveguide connecting an output end of said channel waveguide array to said output waveguides, said output slab waveguide having optical input/output characteristics set to predetermined ratios
15 for the respective output waveguides with respect to said input waveguides; and

level adjusting means for being supplied with the signal lights of respective wavelengths from the output waveguides of said arrayed waveguide grating, and adjusting output levels of said signal lights to desired values.
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18. A demultiplexer comprising:

25 an arrayed waveguide grating comprising one or plural input waveguides for inputting signal lights, a

plurality of output waveguides for outputting signal
lights, a channel waveguide array having waveguides which
are successively longer with predetermined waveguide
length differences, an input slab waveguide connecting an
5 input end of said channel waveguide array to said input
waveguides, and an output slab waveguide connecting an
output end of said channel waveguide array to said output
waveguides, said output slab waveguide having optical in-
put/output characteristics set to predetermined ratios
10 for the respective output waveguides with respect to said
input waveguides depending on the differences between op-
tical losses along respective paths in the output slab
waveguide; and

level adjusting means for being supplied with
15 the signal lights of respective wavelengths from the out-
put waveguides of said arrayed waveguide grating, and ad-
justing output levels of said signal lights to desired
values.

20 19. A multiplexer comprising:
a plurality of light sources;
an arrayed waveguide grating comprising a plu-
rality of input waveguides for inputting signal lights
having different wavelengths each other, one or plural
25 output waveguides for outputting signal lights, a channel
waveguide array having waveguides which are successively

longer with predetermined waveguide length differences,
an output slab waveguide connecting an output end of said
channel waveguide array to said output waveguides, and an
input slab waveguide connecting an input end of said
5 channel waveguide array to said input waveguides, said
input slab waveguide having optical input/output
characteristics set to predetermined ratios for the
respective input waveguides corresponding to the output
waveguides; level detecting means for detecting levels of
10 the signal lights input from said light sources to said
arrayed waveguide grating; and

level adjusting means for comparing the levels
of the signal lights detected by said level detecting
means with predetermined levels for the respective wave-
15 lengths, and adjusting output levels of said light
sources to set the levels of the waveguides multiplexed
by said arrayed waveguide grating to desired values.

20. A multiplexer comprising:
20 a plurality of light sources;
an arrayed waveguide grating comprising a plu-
rality of input waveguides for inputting signal lights
having different wavelengths each other, one or plural
output waveguides for outputting signal lights, a channel
25 waveguide array having waveguides which are successively
longer with predetermined waveguide length differences,

an output slab waveguide connecting an output end of said
channel waveguide array to said output waveguides, and an
input slab waveguide connecting an input end of said
channel waveguide array to said input waveguides, said
5 input slab waveguide having optical input/output
characteristics set to predetermined ratios for the
respective input waveguides with respect to the output
waveguides depending on the differences between optical
losses along respective paths in the output slab
10 waveguide; level detecting means for detecting levels of
the signal lights input from said light sources to said
arrayed waveguide grating; and
level adjusting means for comparing the levels
of the signal lights detected by said level detecting
15 means with predetermined levels for the respective wave-
lengths, and adjusting output levels of said light
sources to set the levels of the waveguides multiplexed
by said arrayed waveguide grating to desired values.

- 20 21. An optical communication system comprising:
optical transmitting means for transmitting
optical signals of respective wavelengths parallel to
each other;
a multiplexer for wavelength-division multi-
25 plexing the optical signals of respective wavelengths
transmitted by said light transmitting means;

an optical transmission path for transmitting
a wavelength-division multiplexed optical signal output
from said multiplexer;

a node disposed in said optical transmission
5 path and having an arrayed waveguide grating;

a demultiplexer for being supplied with the
optical signal transmitted over said optical transmission
path via said node and demultiplexing the optical signal
into the optical signals of respective wavelengths; and

10 optical receiving means for receiving the op-
tical signals of respective wavelengths demultiplexed by
said demultiplexer;

said multiplexer comprising an arrayed
waveguide grating comprising a plurality of input
15 waveguides for inputting signal lights having different
wavelengths from said light source, one or plural output
waveguides for outputting signal lights, a channel
waveguide array having waveguides which are successively
longer with predetermined waveguide length differences,
20 an output slab waveguide connecting an output end of said
channel waveguide array to said output waveguides, and an
input slab waveguide connecting an input end of said
channel waveguide array to said input waveguides, and
having optical input/output characteristics set to prede-
25 termined ratios for the respective input waveguides with
respect to the output waveguides;

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said demultiplexer comprising an arrayed waveguide grating comprising one or plural input waveguides for inputting signal lights, a plurality of output waveguides for outputting signal lights, a channel waveguide array having waveguides which are successively longer with predetermined waveguide length differences, an input slab waveguide connecting an input end of said channel waveguide array to said input waveguides, and an output slab waveguide connecting an output end of said channel waveguide array to said output waveguides, and having optical input/output characteristics set to predetermined ratios for the respective output waveguides with respect to said input waveguides.

- 15 22. An optical communication system comprising:
 optical transmitting means for transmitting optical signals of respective wavelengths parallel to each other;
 a multiplexer for wavelength-division multiplexing the optical signals of respective wavelengths transmitted by said light transmitting means;
 an optical transmission path for transmitting a wavelength-division multiplexed optical signal output from said multiplexer;
25 a node disposed in said optical transmission path and having an arrayed waveguide grating;

a demultiplexer for being supplied with the optical signal transmitted over said optical transmission path via said node and demultiplexing the optical signal into the optical signals of respective wavelengths; and

5 optical receiving means for receiving the optical signals of respective wavelengths demultiplexed by said demultiplexer;

 said multiplexer comprising an arrayed waveguide grating comprising a plurality of input
10 waveguides for inputting signal lights having different wavelengths, one or plural output waveguides for outputting signal lights, a channel waveguide array having waveguides which are successively longer with predetermined waveguide length differences, an output slab
15 waveguide connecting an output end of said channel waveguide array to said output waveguides, and an input slab waveguide connecting an input end of said channel waveguide array to said input waveguides, and having optical input/output characteristics set to predetermined
20 ratios for the respective input waveguides with respect to the output waveguides depending on the differences between optical losses along respective paths in the output slab waveguide;

 said demultiplexer comprising an arrayed
25 waveguide grating comprising one or plural input waveguides for inputting signal lights, a plurality of

output waveguides for outputting signal lights, a channel
waveguide array having waveguides which are successively
longer with predetermined waveguide length differences,
an input slab waveguide connecting an input end of said
5 channel waveguide array to said input waveguides, and an
output slab waveguide connecting an output end of said
channel waveguide array to said output waveguides, and
having optical input/output characteristics set to prede-
termined ratios for the respective output waveguides with
10 respect to said input waveguides depending on the differ-
ences between optical losses along respective paths in
the output slab waveguide.

23. An optical communication system comprising:
- 15 an annular transmission path having a plural-
ity of nodes interconnected in a ring by a transmission
path, for transmitting a wavelength-division multiplexed
optical signal over the transmission path;
- each of said nodes having a first arrayed
- 20 waveguide grating for demultiplexing a wavelength-
division multiplexed optical signal into optical signals
of respective wavelengths, and a second arrayed waveguide
grating for wavelength-division multiplexing the demulti-
plexed optical signals of respective wavelengths;
- 25 said first arrayed waveguide grating compris-
ing one or plural input waveguides for inputting signal

lights, a plurality of output waveguides for outputting
signal lights, a channel waveguide array having
waveguides which are successively longer with predeter-
mined waveguide length differences, an input slab
5 waveguide connecting an input end of said channel
waveguide array to said input waveguides, and an output
slab waveguide connecting an output end of said channel
waveguide array to said output waveguides, and having op-
tical input/output characteristics set to predetermined
10 ratios for the respective output waveguides with respect
to said input waveguides;

said second arrayed waveguide grating compris-
ing a plurality of input waveguides for inputting signal
lights having different wavelengths each other, one or
15 plural output waveguides for outputting signal lights, a
channel waveguide array having waveguides which are suc-
cessively longer with predetermined waveguide length dif-
ferences, an output slab waveguide connecting an output
end of said channel waveguide array to said output
20 waveguides, and an input slab waveguide connecting an in-
put end of said channel waveguide array to said input
waveguides, and having optical input/output characteris-
tics set to predetermined ratios for the respective input
waveguides corresponding to the output waveguides.

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24. An optical communication system comprising:

an annular transmission path having a plurality of nodes interconnected in a ring by a transmission path, for transmitting a wavelength-division multiplexed optical signal over the transmission path;

5 each of said nodes having a first arrayed waveguide grating for demultiplexing a wavelength-division multiplexed optical signal into optical signals of respective wavelengths, and a second arrayed waveguide grating for multiplexing the demultiplexed optical signals of respective wavelengths;

10 said first arrayed waveguide grating comprising one or plural input waveguides for inputting signal lights, a plurality of output waveguides for outputting signal lights, a channel waveguide array having

15 waveguides which are successively longer with predetermined waveguide length differences, an input slab waveguide connecting an input end of said channel waveguide array to said input waveguides, and an output

20 slab waveguide connecting an output end of said channel waveguide array to said output waveguides, and having optical input/output characteristics set to predetermined ratios for the respective output waveguides with respect to said input waveguides depending on the differences between optical losses along respective paths in the output

25 slab waveguide;

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said second arrayed waveguide grating comprising a plurality of input waveguides for inputting signal lights having different wavelengths each other, one or plural output waveguides for outputting signal lights, a
5 channel waveguide array having waveguides which are successively longer with predetermined waveguide length differences, an output slab waveguide connecting an output end of said channel waveguide array to said output waveguides, and an input slab waveguide connecting an input
10 end of said channel waveguide array to said input waveguides, and having optical input/output characteristics set to predetermined ratios for the respective input waveguides corresponding to the output waveguides depending on the differences between optical losses along respective
15 paths in the output slab waveguide.

25. An optical communication system comprising:
optical transmitting means for transmitting optical signals of respective wavelengths parallel to
20 each other;
a multiplexer for wavelength-division multiplexing the optical signals of respective wavelengths transmitted by said light transmitting means;
an optical transmission path for transmitting
25 a wavelength-division multiplexed optical signal output from said multiplexer;

a node disposed in said optical transmission path;

a demultiplexer for being supplied with the optical signal transmitted over said optical transmission path via said node and demultiplexing the optical signal into the optical signals of respective wavelengths; and

optical receiving means for receiving the optical signals of respective wavelengths demultiplexed by said demultiplexer;

10 said multiplexer comprising an arrayed waveguide grating having a plurality of input waveguides for inputting signal lights having different wavelengths, one or plural output waveguides for outputting signal lights, a channel waveguide array having waveguides which
15 are successively longer with predetermined waveguide length differences, an output slab waveguide connecting an output end of said channel waveguide array to said output waveguides, and an input slab waveguide connecting an input end of said channel waveguide array to said in-
20 put waveguides, and having optical input/output characteristics set to predetermined ratios for the respective input waveguides corresponding to the output waveguides; level detecting means for detecting levels of the signal lights input to said arrayed waveguide
25 grating; and level adjusting means for comparing the levels of the signal lights detected by said level detecting means with predetermined levels for the

terminated levels for the respective wavelengths, and adjusting output levels of the light signals to set the levels of the waveguides multiplexed by said arrayed waveguide grating to desired values;

- 5 said demultiplexer comprising an arrayed waveguide grating comprising one or plural input waveguides for inputting signal lights, a plurality of output waveguides for outputting signal lights, a channel waveguide array having waveguides which are successively
- 10 longer with predetermined waveguide length differences, an input slab waveguide connecting an input end of said channel waveguide array to said input waveguides, and an output slab waveguide connecting an output end of said channel waveguide array to said output waveguides, and
- 15 having optical input/output characteristics set to predetermined ratios for the respective output waveguides with respect to said input waveguides; and level adjusting means for being supplied with the signal lights of respective wavelengths from the output waveguides of said
- 20 arrayed waveguide grating, and adjusting output levels of said signal lights to desired values.

26. An optical communication system comprising:
optical transmitting means for transmitting
- 25 optical signals of respective wavelengths parallel to each other;

a multiplexer for wavelength-division multiplexing the optical signals of respective wavelengths transmitted by said light transmitting means;

an optical transmission path for transmitting
5 a wavelength-division multiplexed optical signal output from said multiplexer;

a node disposed in said optical transmission path;

a demultiplexer for being supplied with the
10 optical signal transmitted over said optical transmission path via said node and demultiplexing the optical signal into the optical signals of respective wavelengths; and

optical receiving means for receiving the optical signals of respective wavelengths demultiplexed by
15 said demultiplexer;

said multiplexer comprising an arrayed waveguide grating comprising a plurality of input waveguides for inputting signal lights having different wavelengths, one or plural output waveguides for output-
20 ting signal lights, a channel waveguide array having waveguides which are successively longer with predetermined waveguide length differences, an output slab waveguide connecting an output end of said channel waveguide array to said output waveguides, and an input
25 slab waveguide connecting an input end of said channel waveguide array to said input waveguides, and having op-

tical input/output characteristics set to predetermined ratios for the respective input waveguides corresponding to the output waveguides depending on the differences between optical losses along respective paths in the output
5 slab waveguide; level detecting means for detecting levels of the signal lights input to said arrayed waveguide grating; and level adjusting means for comparing the levels of the signal lights detected by said level detecting means with predetermined levels for the respective wave-
10 lengths, and adjusting output levels of the signal lights to set the levels of the waveguides multiplexed by said arrayed waveguide grating to desired values;

said demultiplexer comprising an arrayed waveguide grating comprising one or plural input
15 waveguides for inputting signal lights, a plurality of output waveguides for outputting signal lights, a channel waveguide array having waveguides which are successively longer with predetermined waveguide length differences, an input slab waveguide connecting an input end of said
20 channel waveguide array to said input waveguides, and an output slab waveguide connecting an output end of said channel waveguide array to said output waveguides, and having optical input/output characteristics set to predetermined ratios for the respective output waveguides with
25 respect to said input waveguides depending on the differences between optical losses along respective paths in

the output slab waveguide; and level adjusting means for being supplied with the signal lights of respective wavelengths from the output waveguides of said arrayed waveguide grating, and adjusting output levels of said
5 signal lights to desired values.

27. An optical communication system comprising:
an annular transmission path having a plurality of nodes interconnected in a ring by a transmission
10 path, for transmitting a wavelength-division multiplexed optical signal over the transmission path;

each of said nodes having a demultiplexer for demultiplexing a wavelength-division multiplexed optical signal into optical signals of respective wavelengths,
15 and a multiplexer for wavelength-division multiplexing the demultiplexed optical signals of respective wavelengths;

said demultiplexer comprising an arrayed waveguide grating comprising one or plural input
20 waveguides for inputting signal lights, a plurality of output waveguides for outputting signal lights, a channel waveguide array having waveguides which are successively longer with predetermined waveguide length differences, an input slab waveguide connecting an input end of said
25 channel waveguide array to said input waveguides, and an output slab waveguide connecting an output end of said

channel waveguide array to said output waveguides, and having optical input/output characteristics set to predetermined ratios for the respective output waveguides with respect to said input waveguides; and level adjusting means for being supplied with the signal lights of respective wavelengths from the output waveguides of said arrayed waveguide grating, and adjusting output levels of said signal lights to desired values;

- said multiplexer comprising an arrayed
- 10 waveguide grating having a plurality of input waveguides for inputting signal lights having different wavelengths, one or plural output waveguides for outputting signal lights, a channel waveguide array having waveguides which are successively longer with predetermined waveguide
- 15 length differences, an output slab waveguide connecting an output end of said channel waveguide array to said output waveguides, and an input slab waveguide connecting an input end of said channel waveguide array to said input waveguides, and having optical input/output
- 20 characteristics set to predetermined ratios for the respective input waveguides corresponding to the output waveguides; level detecting means for detecting levels of the signal lights input to said arrayed waveguide grating; and level adjusting means for comparing the
- 25 levels of the signal lights detected by said level detecting means with predetermined levels for the respective wavelengths, and adjusting output levels of

justing output levels of the light signals to set the levels of the waveguides multiplexed by said arrayed waveguide grating to desired values.

- 5 28. An optical communication system comprising:
 an annular transmission path having a plurality of nodes interconnected in a ring by a transmission path, for transmitting a wavelength-division multiplexed optical signal over the transmission path;
- 10 each of said nodes having a demultiplexer for demultiplexing a wavelength-division multiplexed optical signal into optical signals of respective wavelengths, and a multiplexer for frequency-division multiplexing the demultiplexed optical signals of respective wavelengths;
- 15 said demultiplexer comprising an arrayed waveguide grating comprising one or plural input waveguides for inputting signal lights, a plurality of output waveguides for outputting signal lights, a channel waveguide array having waveguides which are successively
- 20 longer with predetermined waveguide length differences, an input slab waveguide connecting an input end of said channel waveguide array to said input waveguides, and an output slab waveguide connecting an output end of said channel waveguide array to said output waveguides, and
- 25 having optical input/output characteristics set to predetermined ratios for the respective output waveguides with

- respect to said input waveguides depending on the differences between optical losses along respective paths in the output slab waveguide; and level adjusting means for being supplied with the signal lights of respective wave-
- 5 lengths from the output waveguides of said arrayed waveguide grating, and adjusting output levels of said signal lights to desired values;
- said multiplexer comprising an arrayed waveguide grating comprising a plurality of input
- 10 waveguides for inputting signal lights having different wavelengths, one or plural output waveguides for outputting signal lights, a channel waveguide array having waveguides which are successively longer with predetermined waveguide length differences, an output slab
- 15 waveguide connecting an output end of said channel waveguide array to said output waveguides, and an input slab waveguide connecting an input end of said channel waveguide array to said input waveguides, and having optical input/output characteristics set to predetermined
- 20 ratios for the respective input waveguides corresponding to the output waveguides depending on the differences between optical losses along respective paths in the output slab waveguide; level detecting means for detecting levels of the signal lights input to said arrayed waveguide
- 25 grating; and level adjusting means for comparing the levels of the signal lights detected by said level detecting

means with predetermined levels for the respective wave-lengths, and adjusting output levels of the signal lights to set the levels of the waveguides multiplexed by said arrayed waveguide grating to desired values.

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29. A waveguide device comprising:

one or plural input waveguides for inputting signal lights;

10 a plurality of output waveguides for outputting signal lights; and

a slab waveguide having optical input/output characteristics set to predetermined ratios for the respective output waveguides with respect to the input waveguides.

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30. A waveguide device comprising:

a plurality of input waveguides for inputting signal lights;

20 one or plural output waveguides for outputting signal lights; and

a slab waveguide having optical input/output characteristics set to predetermined ratios for the respective input waveguides with respect to the output waveguides.

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31. A waveguide device comprising:

one or plural input waveguides for inputting
signal lights;

a plurality of output waveguides for output-
ting signal lights; and

5 a slab waveguide connecting the input
waveguides to the output waveguides, said slab waveguide
having a core layer disposed therein for propagating
light therethrough from said input waveguides to the out-
put waveguides, said core layer being partly cut off in
10 selected or all paths therein which interconnect said in-
put waveguides and said output waveguides, and a cladding
layer disposed in cut regions of the core layer and on
opposite sides of the core layer, said cut regions in the
paths having cut lengths set to predetermined values in
15 the direction in which the signal lights propagate, de-
pending on optical losses of the signal lights propagated
in the paths.

32. A waveguide device comprising:

20 a plurality of input waveguides for inputting
signal lights;

one or plural output waveguides for outputting
signal lights; and

a slab waveguide connecting the input
25 waveguides to the output waveguides, said slab waveguide
having a core layer disposed therein for propagating

light therethrough from said input waveguides to the out-
put waveguides, said core layer being partly cut off in
selected or all paths therein which interconnect said in-
put waveguides and said output waveguides, and a cladding
5 layer disposed in cut regions of the core layer and on
opposite sides of the core layer, said cut regions in the
paths having cut lengths set to predetermined values in
the direction in which the signal lights propagate, de-
pending on optical losses of the signal lights propagated
10 in the paths.

33. A waveguide device comprising:

one or plural input waveguides for inputting
signal lights;
15 a slab waveguide having an input end connected
to said input waveguides; and
an output waveguide having a plurality of
waveguides connected to an output end of said slab
waveguide, wherein each of selected or all of the
20 waveguides have a core layer disposed therein for propa-
gating light therethrough, said core layer being partly
cut off, and a cladding layer disposed in cut regions of
the core layer and on opposite sides of the core layer,
said cut regions having cut lengths set to predetermined
25 values depending on optical losses of the signal lights
propagated in the waveguides.

34. A waveguide device comprising:

- an input waveguide having a plurality of waveguides for inputting signal lights, wherein each of
5 selected or all of the waveguides have a core layer disposed therein for propagating light therethrough, said core layer being partly cut off, and a cladding layer disposed in cut regions of the core layer and on opposite sides of the core layer, said cut regions having cut
10 lengths set to predetermined values depending on optical losses of the signal lights propagated in the waveguides;
one or plural output waveguides for outputting signal lights; and
a slab waveguide interconnecting said input
15 waveguides and said output waveguides.

35. A waveguide device comprising:

- one or plural input waveguides for inputting signal lights;
20 a slab waveguide having an input end connected to output ends of said input waveguides; and
an output waveguide having a plurality of waveguides connected to an output end of said slab waveguide, wherein selected or all of the waveguides have
25 ends having respective central positions displaced from corresponding focused positions in a direction perpen-

dicular to central axes of the waveguides by predetermined values depending on losses to be given to the signal lights propagated in said waveguides.

- 5 36. A waveguide device comprising:
 a slab waveguide;
 an output waveguide connected to an output end
of said slab waveguide; and
 a plurality of input waveguides having respec-
10 tive ends connected to an input end of said slab
waveguide, wherein selected or all of said ends have re-
spective central positions displaced from corresponding
focused positions in a direction perpendicular to central
axes of the input waveguides by predetermined values de-
15 pending on losses to be given to the signal lights propa-
gated in said output waveguides.

37. A waveguide device comprising:
 one or plural input waveguides for inputting
20 signal lights;
 a slab waveguide having an input end connected
to output ends of said input waveguides; and
 a plurality of output waveguides having re-
spective ends connected to an output end of said slab
25 waveguide, wherein selected or all of central axes of
said output waveguides are inclined at the interconnected

points of the output waveguides and said slab waveguides at respective angles depending on losses to be given to the signal lights coupled at said interconnected points.

5 38. A waveguide device comprising:

 one or plural output waveguides for outputting signal lights;

 a slab waveguide having an output end connected to input ends of said output waveguides; and

10 a plurality of input waveguides having respective ends connected to an input end of said slab waveguide, wherein selected or all of central axes of said input waveguides are inclined at the interconnected points of the input waveguides and said slab waveguides
15 at respective angles depending on losses to be given to the signal lights coupled at said interconnected points.

 39. A waveguide device comprising:

 one or plural input waveguides for inputting
20 signal lights;

 a slab waveguide having an input end connected to output ends of said input waveguides; and

 a plurality of output waveguides having respective ends connected to an output end of said slab
25 waveguide, wherein selected or all of said ends have

waveguide widths set to values depending on losses to be given to the signal lights.

40. A waveguide device comprising:

5 one or plural output waveguides for outputting signal lights;

a slab waveguide having an output end connected to input ends of said output waveguides; and

10 a plurality of input waveguides having respective ends connected to an input end of said slab waveguide, wherein selected or all of said ends have waveguide widths set to values depending on losses to be given to the signal lights.

15 41. A waveguide device comprising:

one or plural input waveguides for inputting signal lights;

a slab waveguide having an input end connected to output ends of said input waveguides; and

20 a plurality of output waveguides having respective ends connected to an output end of said slab waveguide, wherein the lengths between the ends of the output waveguides and said input waveguides are displaced in the direction of propagation axes of the output waveguides depending on losses to be given to the signal

25

lights propagated from said input waveguides to the ends of the output waveguides.

42. A waveguide device comprising:

5 one or plural output waveguides for outputting signal lights;

 a slab waveguide having an output end connected to input ends of said output waveguides; and

 a plurality of input waveguides having respective ends connected to an input end of said slab waveguide, wherein the lengths between the ends of the output waveguides and said input waveguides are displaced in the direction of propagation axes of the output waveguides depending on losses to be given to the signal lights propagated from said output waveguides to the ends of the input waveguides.

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43. A demultiplexer comprising:

 a waveguide device having one or plural input waveguides for inputting signal lights, a plurality of output waveguides for outputting signal lights, and a slab waveguide having optical input/output characteristics set to predetermined ratios for the respective output waveguides with respect to the input waveguides; and

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 level adjusting means for being supplied with signal lights output from the output waveguides of said

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waveguide device, and adjusting output levels of the signal lights to desired values.

44. A multiplexer comprising:

5 a plurality of light sources for respective signals;

6 a waveguide device having a plurality of input
7 waveguides for inputting signal lights, one or plural
8 output waveguides for outputting signal lights, and a
9 slab waveguide having optical input/output characteristics
10 set to predetermined ratios for the respective input
11 waveguides with respect to the output waveguides;

12 level detecting means for detecting levels of
13 the signal lights input from said light sources to said
14 waveguide device; and
15

16 level adjusting means for comparing the levels
17 of the signal lights detected by said level detecting
18 means with predetermined levels for the respective signal
19 lights, and adjusting output levels of the respective
20 signal lights to set the levels of the signal lights
wavelength-division multiplexed by said waveguide device
to desired values.

45. An optical communication system comprising:

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optical transmitting means for transmitting optical signals of respective wavelengths parallel to each other;

5 a multiplexer for wavelength-division multiplexing the optical signals of respective wavelengths transmitted by said light transmitting means;

an optical transmission path for transmitting a wavelength-division multiplexed optical signal output from said multiplexer;

10 a node disposed in said optical transmission path and having a waveguide device;

a demultiplexer for being supplied with the optical signal transmitted over said optical transmission path via said node and demultiplexing the optical signal
15 into the optical signals of respective wavelengths; and

optical receiving means for receiving the optical signals of respective wavelengths demultiplexed by said demultiplexer;

said multiplexer comprising a plurality of input waveguides for inputting signal lights, one or plural
20 output waveguides for outputting signal lights, and a slab waveguide having optical input/output characteristics set to predetermined ratios for the respective input waveguides with respect to the output waveguides;

25 said demultiplexer comprising a waveguide device comprising one or plural input waveguides for input-

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ting signal lights, a plurality of output waveguides for
outputting signal lights, and a slab waveguide having op-
tical input/output characteristics set to predetermined
ratios for the respective output waveguides with respect
5 to said input waveguides.

46. An optical communication system comprising:
an annular transmission path having a plural-
ity of nodes interconnected in a ring by a transmission
10 path, for transmitting a wavelength-division multiplexed
optical signal over the transmission path;

each of said nodes having a first waveguide
device for demultiplexing a wavelength-division multi-
plexed optical signal into optical signals of respective
15 wavelengths, and a second waveguide device for wave-
length-division multiplexing the demultiplexed optical
signals of respective wavelengths;

said first waveguide device comprising one or
plural input waveguides for inputting signal lights, a
20 plurality of output waveguides for outputting signal
lights, and a slab waveguide having optical input/output
characteristics set to predetermined ratios for the re-
spective output waveguides with respect to said input
waveguides;

25 said second waveguide device comprising a plu-
rality of input waveguides for inputting signal lights,

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one or plural output waveguides for outputting signal
lights, and a slab waveguide having optical input/output
characteristics set to predetermined ratios for the re-
spective input waveguides with respect to the output
5 waveguides.

47. An optical communication system comprising:
optical transmitting means for transmitting
optical signals of respective wavelengths parallel to
10 each other;
a multiplexer for wavelength-division multi-
plexing the optical signals of respective wavelengths
transmitted by said light transmitting means;
an optical transmission path for transmitting
15 a wavelength-division multiplexed optical signal output
from said multiplexer;
a node disposed in said optical transmission
path;
a demultiplexer for being supplied with the
20 optical signal transmitted over said optical transmission
path via said node and demultiplexing the optical signal
into the optical signals of respective wavelengths; and
optical receiving means for receiving the op-
tical signals of respective wavelengths demultiplexed by
25 said demultiplexer;

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said multiplexer comprising a plurality of
light sources for respective signals, a waveguide device
having a plurality of input waveguides for inputting sig-
nal lights, one or plural output waveguides for output-
5 ting signal lights, and a slab waveguide having optical
input/output characteristics set to predetermined ratios
for the respective input waveguides with respect to the
output waveguides; level detecting means for detecting
levels of the signal lights input from said light sources
10 to said waveguide device; and level adjusting means for
comparing the levels of the signal lights detected by
said level detecting means with predetermined levels for
the respective signal lights, and adjusting output levels
of the respective signal lights to set the levels of the
15 signal lights multiplexed by said waveguide device to de-
sired values;

said demultiplexer comprising a waveguide de-
vice having one or plural input waveguides for inputting
signal lights, a plurality of output waveguides for out-
20 putting signal lights, and a slab waveguide having opti-
cal input/output characteristics set to predetermined ra-
tios for the respective output waveguides with respect to
the input waveguides; and level adjusting means for being
supplied with the signal lights from the output
25 waveguides of said waveguide device, and adjusting output
levels of said signal lights to desired values.

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48. An optical communication system comprising:
an annular transmission path having a plural-
ity of nodes interconnected in a ring by a transmission
5 path, for transmitting a wavelength-division multiplexed
optical signal over the transmission path;

each of said nodes having a demultiplexer for
demultiplexing a multiplexed optical signal into optical
signals of respective wavelengths, and a multiplexer for
10 wavelength-division multiplexing the demultiplexed opti-
cal signals of respective wavelengths;

said demultiplexer comprising a waveguide de-
vice having one or plural input waveguides for inputting
signal lights, a plurality of output waveguides for out-
15 putting signal lights, and a slab waveguide having opti-
cal input/output characteristics set to predetermined ra-
tios for the respective output waveguides with respect to
the input waveguides; and level adjusting means for being
supplied with the signal lights from the output
20 waveguides of said waveguide device, and adjusting output
levels of said signal lights to desired values; and

said multiplexer comprising a plurality of
light sources for respective signals, a waveguide device
having a plurality of input waveguides for inputting sig-
25 nal lights, one or plural output waveguides for output-
ting signal lights, and a slab waveguide having optical

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input/output characteristics set to predetermined ratios
for the respective input waveguides with respect to the
output waveguides; level detecting means for detecting
levels of the signal lights input from said light sources
5 to said waveguide device; and level adjusting means for
comparing the levels of the signal lights detected by
said level detecting means with predetermined levels for
the respective signal lights, and adjusting output levels
of the respective signal lights to set the levels of the
10 signal lights multiplexed by said waveguide device to de-
sired values.

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